

- Howard, Len. *Birds as Individuals*. 1953.  
 Gaze, Reginald. *Look at This Bird*. 1943.  
 Kemsies, Emerson, and Worth Randle, *Birds of Southwestern Ohio*. 1953.  
 Legendre, Marcel. *Monographie des Mélanges d'Europe*. 1932.  
 Lockley, R. M., *Puffins*. 1953.  
 Lorenz, Konrad. *Comparative Studies on the Behaviour of the Anatinae*. 1951-53.  
 Lynnes, H., *Review of the Genus Cisticola*. (Plates lacking.) 1930.  
 Oberholser, Harry C., *A Monograph of the Genus Chordeiles Swainson*. 1914.  
 Pettingill, Olin Sewall Jr., *A Guide to Bird Finding West of the Mississippi*. 1953.  
 Phelps, Kathleen Deery de, *Aves Venezolanas*. [1954].  
 Robertson, A. W. P., *Birds: Wild and Free*. 1950.  
 Rogers, Cyril H., *Care and Breeding of Budgies (Shell Parrakeets)*. 1953.  
 Saunders, Howard, *An Illustrated Manual of British Birds*. (2nd ed.) 1899.  
 Skutch, Alexander F., *Life Histories of Central American Birds*. 1954.  
 Smith, Stuart, *The Yellow Wagtail*. 1950.  
 Taverner, P. A., *Les Oiseaux de l'Est du Canada*. 1922.  
 Tinbergen, N., *Social Behaviour in Animals, with Special Reference to Vertebrates*. 1953.  
 Tinbergen, N., *The Study of Instinct*. 1951.  
 Townsend, Charles Wendell, *Supplement to The Birds of Essex County, Massachusetts*. 1920.  
 Uchida, S., [Students' Colored Handbook of Animals.] 1954.  
 Yarrell, William, *A History of British Birds*. (2nd ed., 3 vols.) 1845.

## THE CONTINUING NEED FOR FOOD HABITS RESEARCH

*A contribution from the Wilson Ornithological Club  
Conservation Committee*

Twenty years ago the writer called attention to certain limitations of stomach analysis in determining the economic status of birds (1934. *Wilson Bull.*, 46:73-90). The deficiencies mentioned pertained to (1) the difficulty in placing economic interpretations on some of the important food items disclosed, and (2) the impossibility of mathematically converting abstract food percentages into terms of human economics.

In the same article pains were taken to emphasize the everlasting importance of stomach analysis as a technique in disclosing information sorely needed in solving other problems in wildlife management. "Aside from the legitimate demands of pure research in food habits to which stomach examination has and will continue to contribute bountifully, certain of the practical problems of economic ornithology lend themselves to direct solution solely or largely through this method of approach, . . . those in which the identification of food items constitute the major objective. . . . Whenever we are seeking the *identity* of food items, irrespective of the economic significance of the bird's having fed on them, or whenever we aim to determine merely the presence or absence of particular items of diet, analysis of stomach contents is the only direct and reliable method of approach."

To illustrate my point I cited the case of the night herons, erroneously accused of being a hazard to the "frogging" industry of Louisiana. In the stomachs of more than a hundred, collected in the critical area, not one frog was discovered. Reference also was made to alleged damage to timber by birds when, as a matter of fact, actual injury was inflicted by insects more or less concealed, which served as a lure and in that manner incriminated the more conspicuous birds. Numerous other cases might have been cited at that time, and, since that article was written, even more convincing testimony could be invoked to demonstrate the importance of stomach analysis in solving certain aspects of modern wildlife- and farm-management problems.

How little this was appreciated even by those whose information should be reasonably accurate and how tragic ignorance may be under those circumstances, was revealed by

what took place in the legislative halls of our National Capitol about a decade ago. At that time an appropriation for the continuation of food habits studies of birds and mammals by the Fish and Wildlife Service was being discussed. A trite comment that "every small boy knows what a robin eats; it eats angleworms" was advanced as a reason for the termination of formal studies of the food of birds and mammals by the Fish and Wildlife Service. The project that had served as the basis of much of what we know in this field was thus ended.

Whereas it is true that, both at the Patuxent Wildlife Research Refuge in Maryland and at the Wildlife Research Laboratory at the Denver (Colorado) Federal Center, limited stomach analyses are still being conducted with finances and under authority provided from other sources, the activities are restricted largely to the solving of local or limited problems. The work often is carried out with finances and personnel coming from the Cooperative Wildlife Research Units or from Pittman-Robertson sources. At best it is an intermittent program with an uncertain future.

These facts are not generally known by those who long have looked to the Fish and Wildlife Service and its predecessor, the Biological Survey, as a source of factual information on the food and economics of wildlife. The lessened output of substantial contributions of such nature during recent years has been attributed by uninformed individuals to a variety of causes—to a change of interests by administrative personnel, to a feeling that there is nothing more of value to be done or learned, to a departure of those who, through the years, have contributed to the subject, or to some other surmise. Actually, the activity was terminated by a legislative and budgetary restriction from which there is no appeal or possibility of change except through those same channels. That there is an impelling need for well-equipped and competently staffed laboratories for wildlife food analyses is admitted by all who have attempted to do the same thing with inadequate means.

In the meantime reference collections and laboratory facilities and files, though maintained to the limits possible, have not been used to their fullest capacity and technical personnel, experienced in the field of stomach examination, has devoted its time largely to other matters. With such lapses associated values tend to deteriorate if not disappear from the scene. Without continued use, reference collections and their related files have suffered for lack of sympathetic attention; new and much needed additions have not been made; personnel involved has been handicapped through lack of "practice"; and, most important in a long-time appraisal of the situation, newcomers have not been trained to take the places of those, who for one reason or another, will step out of the picture.

Whereas the objectives of modern wildlife research are different from those of a generation ago, stomach examination as a means of investigation has lost none of its significance. It has even become of greater import through new applications. What wild creatures do or do not eat has a definite bearing on problems of nutrition and the contraction of disease. There is a growing conviction that the periodic mortality of Canada Geese at Pea Island, North Carolina may have its origin in a food habits or nutritional factor leading to excessive parasitism and ultimate emaciation and death of the birds.

Entomologists are still vitally concerned regarding the role of vertebrate enemies in the control of insect pests. Requests have been made in Colorado for an appraisal of woodpeckers in relation to the spruce bark beetles, and elsewhere with regard to the destructive spruce bud worm and the white pine weevil. In each case stomach examination of potential enemies would reveal from what source greatest aid might be expected. The extent to which birds avail themselves of proffered foods set out for their express use

is readily disclosed by the examined stomach. Consequently there is a continuing need of food habit studies to determine the usefulness of specific management practices on refuges, public shooting grounds and on other areas.

The knowledge of the experienced food analyst also has application in other directions. He may aid law enforcement in the identification of evidence, be it feathers, fur, bone, or even flesh or fats. Such testimony is seldom challenged and never effectively refuted. Knowledge now being used to assure correctness of labels in the fur industry had some of its beginnings in the laboratory where the stomachs of coyotes and bobcats and the regurgitated food pellets of birds of prey were being examined.

That the end products of wildlife food analysis may go far beyond the province of the wildlife technician is brought out by the Martin, Zim, Nelson volume on "American Wildlife and Plants" (McGraw-Hill Book Company, Inc., New York, 1951). Therein the condensed information gleaned from the thousands of stomachs of birds and mammals, fish, reptiles and amphibians examined during a period of over 60 years, is made available for foresters, landscape-gardeners, and botanists. Even the morphology of seeds and the phylogeny of the plants which bear them have been given a significant stimulus through studies based on the food habits collections at the Patuxent Laboratory of the Fish and Wildlife Service (Martin, A. C., 1946. *American Midl. Naturalist*, 36:513-660).

From the very nature of the case food habits research laboratories have to be adequate. Their reference collections must be well supplied with bird and mammal skins and skeletons, alcoholic specimens of reptiles, amphibians, fishes, crustacea, and various fleshy invertebrates, pinned specimens of insects, microscopic slides of hair and fur samples, an herbarium of wildlife food plants, a comprehensive collection of seeds and other fruits of plants likely to be eaten and, above all else an adequate reference library to aid in the identification of specimens. There must also be working facilities, microscopes, collection cases, fume hoods to remove objectionable odors, and the ordinary tools, reagents and other materials that permit it to function effectively.

Then, of course, there is the all-important element of a competent staff with which to operate. In the field of stomach analysis of wildlife there is no substitute for experience. Without that even the most complete of collections and the best of technical equipment will avail little.

The foregoing all points to the fact that, if research in wildlife is to avail itself of food analysis as a working tool, the facilities needed are destined to be extensive and costly; to create these on short notice would be impossible and to duplicate them locally throughout the country would be highly uneconomical.

A score of years ago one of America's leading ecologists sounded a warning against the perennial impoverishment of research in food habits of birds and mammals (Errington, 1935. *Science*, 81, (2103):378-379). "It seems more than a little ironical that this division [of the Biological Survey] with its highly trained personnel, its unmatched reference collections and its strategic possibilities as an ecological clearing house be the perennial target of crippling economies, with occasionally its very existence threatened.

"In short, from the standpoint of one interested in wildlife management and foreseeing the great development that will surely occur, it is apparent that the necessary supporting researches into the food habits of organisms are barely entering the tremendous field of significant endeavor that awaits."

If such apprehension was justified at a time when modest funds were still available for the study of the food of wildlife by a Federal agency, what form of expression can adequately portray the present situation?—E. R. KALMBACH.